

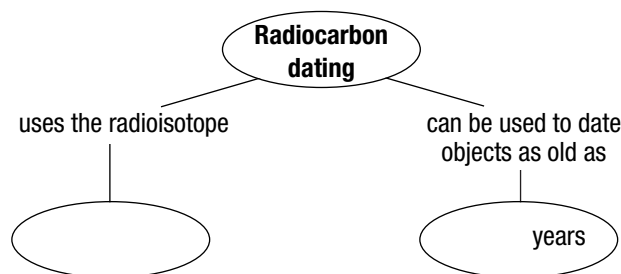
Chapter 10 Nuclear Chemistry

Section 10.2 Rates of Nuclear Decay**(pages 298–301)**

This section discusses half-lives and explains how nuclear decay can be used to estimate the age of objects.

Reading Strategy (page 298)

Identifying Details As you read, complete the concept map below to identify details about radiocarbon dating. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

**Half-life (pages 299–300)**

1. A nuclear decay rate describes _____.
2. Is the following sentence true or false? All radioisotopes decay at the same rate. _____
3. Describe a half-life. _____
4. Circle the letter that describes a sample of a radioisotope after two half-lives.
 - a. One eighth of the original sample is unchanged.
 - b. One quarter of the original sample is unchanged.
 - c. Half of the original sample is unchanged.
 - d. Three quarters of the original sample is unchanged.
5. Circle the letter of the correct answer. Iodine-131 has a half-life of 8.07 days. What fraction of a sample of iodine-131 is left unchanged after 16.14 days?

a. $\frac{1}{2}$	b. $\frac{1}{4}$
c. $\frac{1}{8}$	d. $\frac{1}{16}$
6. Is the following sentence true or false? Like chemical reaction rates, nuclear decay rates vary with the conditions of reaction.

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Use the following table to answer questions 7 and 8.

Half-Lives of Selected Radioisotopes	
Isotope	Half-life
Radon-222	3.82 days
Iodine-131	8.07 days
Thorium-234	24.1 days
Radium-226	1620 years
Carbon-14	5730 years

7. Circle the letter that identifies which sample would be the most unchanged after 100 years.
- a. iodine-131 b. radium-226
c. radon-222 d. thorium-234
8. Circle the letter of the correct answer. How much of a 1.00 gram sample of radium-226 is left unchanged after 4860 years?
- a. 0.500 g b. 0.250 g
c. 0.125 g d. 0.050 g

Radioactive Dating (pages 300–301)

9. How is carbon-14 formed in the upper atmosphere? _____
10. Circle the letter that identifies the correct equation for the beta decay of carbon-14.
- a. ${}^{14}_6\text{C} \longrightarrow {}^{14}_7\text{N} + {}^0_{-1}\text{e}$ b. ${}^{14}_6\text{C} \longrightarrow {}^{13}_5\text{B} + {}^1_1\text{p}$
c. ${}^{14}_6\text{C} \longrightarrow {}^{14}_5\text{B} + {}^0_{-1}\text{e}$ d. ${}^{14}_6\text{C} \longrightarrow {}^{10}_4\text{Be} + {}^4_2\text{He}$
11. Is the following sentence true or false? Plants and animals continue to absorb carbon from the atmosphere after they die. _____
12. How is the age of an object determined in radiocarbon dating? _____
13. Circle the letter of each characteristic of radiocarbon dating.
- a. Carbon-14 levels in the atmosphere can change over time.
b. Carbon-14 levels in the atmosphere stay constant.
c. Scientists often use objects of known age in radiocarbon dating.
d. Objects of known age are not useful in radiocarbon dating.
14. Is the following sentence true or false? Radiocarbon dating is highly accurate in dating objects that are more than 50,000 years old. _____